778 [131] Berber-speaking people say that the fire in the fire-place is
372 blessed (Aglu), that it is praying to God for food (Demnat), and that if it goes out there will not be much food to cook (Aglu, Demnat) or the baraka will leave the house (Ait Waryager).

[132] The Ait Waryager do not extinguish the fire or let it go out
[155] unless they leave the house for a time. Fire is used for curative purposes, and so are ashes.

823 [138] Many other acts, besides prayer, are performed in the direc-
778 tion of Mecca on account of its baraka, for example, the slaughter of an animal.

[893] A child begotten by a man who has sexual intercourse in such a position will be blessed (Ait Waryager) or have a face "shining like the sun and the moon" (Andjra).

801 [142] The number seven figures very prominently in the theology,
772 as well as in the ritual, of Islam—there are seven heavens, seven earths, seven seas, seven divisions of hell with seven gates, seven days, and so forth; indeed, so frequent is the use of this number that a whole book in Arabic is written on it. Groups of seven saints buried at [143] the same spot (seb at u rijal) are found in many places in Morocco. But there is also the saying, seb a s aiba, "seven is difficult". It would be unlucky for the buyer of a thing to pay for it seven muzunat or seven blain or seven dollars exactly (Andjra, Hiaina, Ait Waryager; but not in Fez), and sometimes the number seventy is also avoided in similar circumstances (Hiaina).

373 [161] Strange phenomena of light are often connected with dead saints.

824 [162] In the Rif also there are trees connected with saints which
778 are seen shining at night, for example, a fig tree growing at Sidi Ahmed Marrui's shrine in the district of the Ait Waryager; my informant had seen it himself.

776 [163] The miracle-working capacity of dead saints, however wide its scope may be, is often to some extent specialised.

778 [164] Among the Ait Waryager a person who wants to learn to
[534] play the flute (dasebbabt) visits the shrine of Sidi Esa, kills a cock or a hen, and spends a night there playing on his flute; and a week and a fortnight after he again visits the shrine.

776 [174] Many saints have their special days for receiving petitioners.
796 To take a few instances:—

Sidi Buhaiyar among the Ait Waryager on Thursdays and Fridays.

776 practices and beliefs it was said that a person who sees meat and is not
264 allowed to taste it gets angry and is therefore attacked by the jnun haunting the meat, and also that the jnun haunting the person may hurt him because they do not get the meat they are longing for. We must not expect very clear ideas with regard to haunted objects; yet both explanations well agree with the fact that some of the customs in question have particular reference to women and children, who are more than others exposed to the attacks of jnun. If a person offers another meat the latter must accept it, even though he does not want to eat it; only an enemy can refuse such an offer, since a refusal would be attended with very serious consequences for the person who offered it—he may even die (Ulad Bu aziz, Andjra, Ait Sadden). But I have also heard that the bas, or evil, will fall upon the person who refuses to accept the meat (Hiaina), or that both parties will have to suffer (Ait Waryager).

776 [280] Excrements of men and of animals which are not used for
514 food are extremely haunted. The Ait Waryager say that there are
753 Jewish jnun in the dung-heap (dazubait, in Arabic zebbala) of the household; and water-closets and drains are favourite abodes of jnun. In this connection some beliefs and practices relating to improper behaviour may be mentioned in addition to those noticed before. When a person does his needs he should cover his head with his hayek or the hood (qobb) of his jellaba, he must look neither right nor left, and if he speaks his children will be qora, that is, affected with ringworm (Fez). If a boy does his needs on the road—nobody but a boy can do such a thing—he will have boils (Ulad Bu aziz); the Ait Waryager say that he must be a bastard (mmis rahram). If a person makes water on the road, the bas enters underneath his nails and and makes them diseased (Andjra) or he will have hangnails (Ait Waryager) or he will be forgetful (Fez).

776 [293] Jnun also haunt the fire and the fire-place (in Arabic
372 l-kanun; in Berber takat or takkat [Sheliha], almssi [Ait Sadden],
513 tahfurt n tmssi [Ait Warain], dagandort [Ait Waryager]). If a person sleeps with his head near the fireplace, he is very liable to be struck by them; some people say that he will never get well again, while according to others he will have a headache or be troubled with bad dreams.

776 [294] To throw out a brand from the fire-place when it is raining
372 makes the angels blind (Hiaina); indeed, fire ought never to be thrown

776 out of the house but should be extinguished indoors, as there are jnun
●372 at the door (Ait Waryager).

373 [295] A light should not be extinguished by blowing; if anybody blows out a light he will have a rank breath (Shawia, Aglu), or his face may become distorted (Ait Waryager).

342 Besides the fire-place there is another haunted place in the house,
776 namely the threshold. Nobody is allowed to sit down on the threshold
784 of a house or at the entrance of a tent; should a person do so, he would become ill himself or give bas to the dwelling. So also it would be unlucky for the house and its inhabitants if anybody should pull up the backs of his slippers on the threshold (Hiaina, Amzmis,
[585] Igliwa). A bride is carried across it; Chenier says that when the bride enters the bridegrooms's house, her relatives carefully observe that "she shall not touch the threshold of the door". The "masters of the house" are walking in and out over the threshold. Every house, and indeed every place, has its jenn-owners: kull mahall be mwalih. These spirits are called "the masters of the place", in Arabic mwalin le-mkan (mwalin l-mkan), in Berber ayitbab umhan (Ait Waryager) or idbab w wansa (Ait Sadden); or "the men" or "people of the place", in Arabic rijal le-mkan, in Berber ait lmakan (Shelha) or ait udgar (Igliwa); or "the masters of the house", in Arabic mwalin d-dar, in Berber [296] lemluk n tgimmi (Aglu). If the masters of the house are good the inhabitants will prosper, if bad they will have misfortunes or soon die. These jnun are frightened by dogs, by photographs, and by whistling.

802 [298] Among the Ait Waryager, if anybody receives money in the late afternoon or in the evening, he spits on it so that it shall remain in his bag; but it is their custom not to make any payment after asar.

802 Grinding corn, touching grain, lending a handmill to a neighbor,
784 taking corn or a handmill or sieve out of the house or tent, and giving away yeast, are acts which are prohibited at or after asar or between
[264] asar and sunset. People should not eat in the dark, because, if they do, jnun may be eating with them. Food kept inside the house over night is covered up to prevent jnun from eating of it (Hiaina, Ait Waryager).

784 [299] The Ait Waryager maintain that not only food but water
776 which is kept inside the house over night should be covered up, to
272 prevent jnun from drinking of it.

784 People refrain from washing themselves with such water,[1] since
776 there may be jnun in it or jnun may have made water in it (Ait
515 Waryager, Andjra); and bathing after asar is avoided unless special precautions are taken or it is done in a public bath, where there is salt. Nobody, however, would like to go alone into a public bath at night—indeed, many persons are afraid of doing so even by day. It is said, Men hajama ba d l- asri au ama au nama qalil s-salama, "From blood-letting or bathing or sleep after asar comes little health". A Rifian told me that if a person washes his body after dhor, jnun will make him ill; if he washes his face after sunset, they will give him night-blindness (butallis or [307] budaddis); and if he has his head
[302] shaved after asar, he will have a headache. Shaving after asar, or at least between asar and sunset, is, I believe, universally avoided. In Aglu it is the custom for a person who has to cross a river at night to recite the 112th chapter of the Koran (suratu l-ihlas) before cross-
[513] ing. In Dukkala I was told that nobody would like to sleep at night near a well. To pour hot water on the ground is particularly dangerous after asar, at least if it is done without the accompaniment of the bismillah.

784 To pour water on fire or ashes, too, or to tread on ashes, is most
372 dangerous after asar. To carry ashes after asar is avoided, and so is in some Berber tribes (Igliwa, Ait Waryager) the carrying of fire from one house to another.

776 [307] It is natural that men do their best to protect themselves
789 and their belongings against beings so fiendish and dangerous as the jnun generally are. They have found out somehow that there are various means by which the spirits may be kept at a distance, and they make use of these means for their own benefit.

The jnun are fond of darkness and terrified by light. The burning of candles is therefore a means of keeping them away from lying-in women and newborn infants, from brides and bridegrooms, and from dead persons before they are buried.

The jnun abhor salt, especailly rock-salt. Hence, when afraid of being struck by jnun, many Moors put salt in or underneath their pillows, or strew salt on their beds or under the mats on which they are sleeping, or take salt in their hands if they go out at night, or eat salt if they have been frightened. There are persons who strew salt on the floors of their houses or tents on the twenty-seventh night of

[1] [i.e. Water kept indoors overnight. – Analyst]

789 evening prayer in the mosque, pray there a thousand times for the Prophet, each of them keeping count of his prayers by placing a pebble in front of him after the completion of every hundred.

[266] The custom of using a ladle as a rain-charm is common among the various Berber groups. Among the Ait Waryager in the Rif the women dress up a wooden ladle (aganja) in women's clothes and walk with it to the village mosque or some shrine, praying for rain.

[372] [276] As water extinguishes fire, so fire is also supposed to destroy the rain. Among the Ait Waryager rain is stopped by a man whose name is 'Esa boiling some rain-water in an earthenware pan (anahadam) ordinarily used for the baking of bread, and then discharging a loaded gun in the air.

[279] Among the Ait Waryager, if there is too much rain, scribes write on a board the names of either ninety-nine or one hundred and one saints, and place the board on the roof of the village mosque.

[282] The Ait Waryager, again, stop a westerly gale by girdling a dog with a woollen belt, which is left on it as long as the gale lasts.

[283] BELIEFS AND CUSTOMS RELATION TO ANIMALS

231 [284] In some tribes it is the custom for a man who buys a stallion to kill a sheep or goat and invite the men of the village to a meal; after they have eaten they make fatha, calling down blessings on the host and his animal (Ait Yusi, Ait Waryager).

[285] Among the Ait Waryager, when a person has bought a horse, mule, donkey, bullock, or cow, or some sheep or goats at the market, he treats those who accompanied him there with grapes, raisins, figs, or other eatables, and they in return call down blessings on him and the animal or animals he bought.

Among the Ait Waryager a person who has bought a mare or some other female animal puts a silver bracelet (damqayyast) or a pair of silver brooches (dibzimin, sing. dabzind), such as women wear over their breast, at the entrance to the yard (azqaq) and makes the animal walk over it, in order that it shall be fertile and good and not run away.

[177] [287] Among the Ait Waryager donkeys, as also horses and mules, with black spots in their mouths are not bought by anybody, and a white spot on the forehead of a donkey or a mule, but not on that of a horse, is likewise considered bad fal.

443 438 occasion is some indication of the poverty of the land in which they live.

Throughout the year there are long rows of hardware and spice booths where a wide variety of non-indigenous products are sold, including cakes of soap, toothpaste, mirrors, nails, locks, cooking utensils, drinking glasses, matches, and plastic jewelry. [263] The spices include red pepper, paprika, black pepper kernels, stick cinnamon, curry, and saffron. Off in another section are men selling blankets, rugs, and clothing, both new and old. [291] [177] While men can buy both Western and traditional clothes, the only type of dress available for women is traditional. It is perhaps fortunate that the native dress is so loose-fitting, since the men purchase these garments for their wives with only the roughest notion of sizes. There are also people selling [372] [373] articles made from cane or palmetto--brooms, baskets, and so forth, as well as vendors of kerosene, the only source of light for the fellah. Outside the market is a specially walled-off area, the livestock market; there cows, goats, and sheep are sold. Some of these are bought directly by the butchers who prepare the meat for immediate sale; others are sold to merchants who transport the animals to the richer province of Nader where they are fattened for resale.

443 445 463 231 In addition to these merchants, there are people who have a service to sell. Included in these are the butchers, who are perhaps the most prominent of this group in that they handle the largest volume of business. They arrive early at the market,

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tains of the upper Nkour. The same expression is applied to the mountains on the route between Vélez and Fez (probably the Sanhajan highlands), and to "Mount Seusaoen" (i.e., Shawen, probably Jbil Tisuka). Leo's account of the eastern sector of northern Morocco is very different. The plains of Garet are described as a desert, and the lower Moulouya Valley as being "unpleasant and dry," with "no water but that of the river Muluia."

Accounts of forest in the Rif highlands are to be expected, but it is surprising to find repeated references to forest on the Mediterranean coast. Similar accounts appear in the works of Arab writers of the twelfth and thirteenth centuries, and Strabo describes the Ceuta promontory as being clothed with a mantle of great trees. The frequent mentions of trees near Ceuta suggest a profound modification of vegetation in subsequent years. Accounts of shipbuilding and lumber trade indicate some commercial logging; the retreat of the forest near Ksar as-Srair, Ceuta, and Vélez might have been a direct result of these activities. Leo's reference to "great want of wood" at Arcila suggests that the hills and marine terraces of the Tangier-Tetuán-Arcila triangle had been cleared before his time, but extensive woods still existed in the basin of Wad Lukkus. His evaluation of the Moulouya Valley may have been prejudiced by previous exposure to more verdant areas, but "desert" does not mean forest, or even a rich formation of scrub.

Agents and Processes of Change

In northern Morocco today, the most important agents of deforestation are: (1) domestic and industrial consumption of wood, (2) burning to "improve" pastures and to clear fields for cultivation, and (3) destruction of palatable plant material by sheep and goats. These processes are evident even to the casual observer, but it is difficult to determine their relative importance. Despois believes that the principal causes of deforestation have always been the need for fuel and new land to till.[11] Braun-Blanquet describes the Mediterranean garrigues as "zoöbiotically conditioned communities."[12] Kuhnholtz-Lordat is convinced that the greatest agent of deterioration has been fire.[13]

Each emphasis is supported by abundant evidence, but it may be doubted whether the several causes of deforestation can be treated independently. A series of fires, if not too closely spaced, may not result in deforestation, but burning followed by heavy pasturing inevitably does. Most of the broad-leaf trees in northern Morocco reproduce themselves from shoots after being burned or felled, but in areas overrun by goats the shoots are browsed down and forest degenerates to scrub. In tangled brush formations it is often difficult to tell whether the main destructive agent has been fire, domestic animals, or man.

Consumption of Wood

Although kerosene lamps burn in many Moroccan homes, charcoal and wood are the only important domestic fuels.[14] Butane and electrical appliances are

[11] Despois, *op. cit.*, p. 84, cited in note 13.

[12] J. Braun-Blanquet, *Pflanzensoziologie: Grundzüge der Vegetationskunde* (2d ed., Vienna: Springer, 1951), p. 371.

[13] G. Kuhnholtz-Lordat, *La Terre incendiée: essai d'agronomie comparée* (Nimes: Editions de la Maison Carrée, 1939), *passim*.

[14] Anthracite of excellent quality has been mined at Djerada south of Oujda since 1931, but

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seldom seen except in the European quarters of the larger towns. When a feast is in prospect, food is sometimes boiled in earthen pots set about an open fire. Wood fires also heat bake ovens. But most if not all Moroccan cooking is done over a charcoal brazier, consisting of an iron pot and tripod or simply an old gasoline tin. The brazier is used several times a day to boil water for tea; indeed, more fuel is consumed in this process than in cooking. Blacksmiths and other craftsmen rely upon charcoal, and lime kilns are found near every town.

Charcoal is a valuable fuel, for it has about twice the heating power of wood and burns without flame or smoke. In Morocco wood is converted to charcoal in shallow pits thinly covered with earth. But this process of partial combustion is extremely wasteful, since much of the volatile material in the wood is lost. The best charcoal is obtained from the denser hardwoods, especially the oaks. *Quercus Ilex* is the preferred wood, and this preference helps to explain the degraded aspect of most stands of this tree. The cork oak, the kermes oak, the oleaster, *Pistacia lentiscus, Rhus pentaphylla,* and *Arbutus Unedo* also yield excellent charcoal. Where the choice of wood is limited, many shrubs are utilized, and all available trees. No reliable estimate of the amount of charcoal annually consumed in northern Morocco has ever been published, but it must be enormous, for a charcoal brazier of some sort burns in every home.[84] During any day of the year, women and animals may be seen carrying loads of wood or charcoal to the cities and towns (pl. 8, *b*).

Mud brick or stone usually forms the walls of houses, but wood is always required for the rafters. In the deforested eastern sector, houses are built long and narrow so that branches and twigs can be used as a covering. When available, slender riparian or coniferous trees are used as rafters, but in most of northern Morocco such trees cannot be obtained.

Riparian forests are rare today apart from some canyons in the mountains, where the remaining stands of *Salix, Alnus, Populus, Vitex,* and *Crataegus* become thinner each year. *Nerium oleander,* the riparian "tree" of the hills and plains, is of little value in construction, and the oleaster and oaks are usually too massive or knarred.

The common type of house in Gal'aya and the Rif is well adapted to an environment poor in timber. In the Rifian dialect the word for "sloping roof" (*thazukha*) is the general word for all roofs, whereas a special word (*asthih*) is used for the now prevalent flat roofs.[85] The fact that the generalized word for roof is the same as that for a sloping one indicates greater antiquity for the latter variety. There is evidence that flat and narrow houses of the eastern type have recently replaced dwellings demanding more wood along the entire western frontier of the Rif.[86]

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most of this production has been consumed by factories in the Casablanca district and by the railroads of northern Africa. Fernand Joly *et al., Géographie du Maroc* (Paris: Delagrave, 1949), pp. 135–136.

[84] The estimate of "four to five metric tons" published by the Spanish forestry service takes account only of commercial operations. E. González Vázquez, *El Marruecos forestal* (Madrid: Ediciones Técnicas, 1945), p. 72.

[85] C. S. Coon, "Tribes of the Rif," *Harvard African Studies,* 9 (1931), 69.

[86] Coon, *loc. cit.,* traces this change to the burning of houses during feuds in the pre-protectorate period, and to the fact that many families found it difficult to obtain lumber after the end of Abd al-Krim's rebellion. For evidence of changes in recent years, compare his map of house types (p. 71) with fig. 15 of the present study.

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314 High Atlas. Deforestation can be traced also to the tanners of Fez and Tetuán.[110]
311 The tanners' guild in Fez goes back to the ninth century, when master tanners
191 gathered at this site from Córdoba, Qayrawan, and distant Iran. Fez leather was once exported as far away as Baghdad, and shoes went to Egypt until the present century. During the peak years of production. Fez craftsmen tanned about 500,000 skins a year. The descendants of the original immigrant craftsmen are still busy making handbags, slippers, and other articles for the tourist and export trade.

It is not surprising that *Quercus Ilex,* an important source of tannin, should now be rare in the hills near Fez and Tetuán. There is good reason to believe that the holly oak once covered these hills. One well-informed botanist asserts that the primordial cover of the limestone mountains south of Tetuán probably was a "climax" forest of holly oak.[111] In Gal'aya and the eastern Rif, careless stripping of the bark of *Rhus pentaphylla,* a source of red dye, destroys many trees; "Morocco leather," a trade name in bookbinding, is customarily made from goatskin tanned with sumac.

Effects of Burning

372 In the eastern Rif the plant cover is usually too sparse to maintain a fire, and
241 on the Atlantic littoral there is little land left to clear. But between these areas
191 is a large zone covered with forest or scrub that must be burned before the land
311 can be plowed. Some attempt is usually made to control the spread of fire, but conflagrations develop when tinder-dry shrubs are fanned by brisk winds. Fire is employed also for the "improvement" of pasture, for increased blossoming ("bee pasture"), and probably for the mere pleasure of burning or out of carelessness.[112]

233 The importance of pastoral fires has been emphasized by most students of the
372 Mediterranean landscape,[113] but in northern Morocco fires set to clear away nox-
191 ious shrubbery or to facilitate movement of stock are less important than agri-
241 cultural fires. Pastoral fires are neither necessary nor desirable where there are
311 goats, for these animals thrive on woody browse and can break through the thickest scrub. Sheep outnumber goats only in the drier eastern sector, where impenetrable formations are rare. For every fire set to "improve" pasture, probably more than ten are set to prepare new fields for plowing.

372 Whatever its cause, fire is a major agent of deforestation. The difficulty is
311 that there are many kinds of fires: quick fires that run over a thin mantle of vegetation, great conflagrations that consume thicker formations, fires that remain close to the ground, fires that extend to the crowns of trees. It makes a great deal of difference whether fires recur after five or after twenty-five years. Moreover, the important factor may be not the fire itself but what happens to an area after it has been burned.

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[113] [110] R. le Tourneau, L. Paye, and R. Guyot, "La corporation des tanneurs et l'industrie de la tannerie à Fès," *Hespéris,* 21 (1935), 167–240; A. Joly, "L'industrie à Tétouan," *Archives Marocaines,* 8, 15, 18 (1906–1912).

[113] [111] J. Ruis de la Torre, *El matorral en Yebala (Marruecos español)* (Madrid: Instituto de Estudios Africanos, 1955), pp. 26–27, and the map showing the "natural area" of *Quercus Ilex.*

[113] [112] H. Marc, *Notes sur les forêts de l'Algérie* (Paris: Larose, 1930), p. 396, lists the causes of serious forest fires from 1886 to 1915 as "accidents" (8 per cent), "imprudence" (32 per cent), "intentional" (23 per cent), "unknown" (37 per cent).

[113] [113] G. Kuhnholtz-Lordat, "Influence des feux pastoraux dans la région méditerranéenne," *Jour. d'Agriculture Tropicale et de Botanique Appliquée,* 3 (1956), 785–791.

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372 137 311 Plants that are somewhat resistant to fire or are stimulated to multiply and reproduce by fire have been called pyrophytes.[a] There are many kinds of pyrophytes, for resistance to or stimulation from fire may be achieved in several ways. The cork oak could be called a pyrophyte of passive resistance, for it is protected by thick insulating bark. Plants that send out new shoots after their aerial organs have been partly or completely destroyed might be described as pyrophytes of vegetative reaction. Budding may take place above ground, as in the thuya, or below ground, as in the kermes oak, palmetto, madrone, and numerous Mediterranean shrubs. Trees that cast deep shade (e.g., undisturbed holly oaks) could be termed pyrophytes of indirect resistance. Finally, some trees and shrubs that seed heavily and grow rapidly (e.g., Aleppo pine and species of *Cistus*) might be described as social pyrophytes.

372 114 137 311 This classification, derived from the pioneer work of Kuhnholtz-Lordat, has much to recommend it,[b] but, like all classifications, it has some faults. The passive resistance of the cork oak depends upon the lapse of time since the last stripping of the bark. Pyrophytes of vegetative reaction may be destroyed if fires recur in rapid succession. In northern Morocco it is hard to think of a good example of indirect resistance. Some stands of cork oak and holly oak have shaded floors and sparse underbrush, but during the dry season such formations may be inflammable. Again, although the Aleppo pine is an excellent pioneer, it may be exterminated if fires recur in rapid succession or if the young shoots are browsed.

372 137 311 Recurrent burning thus favors some plants and discourages others. Continuous repetition of brush fires produces communities rich in geophytes and therophytes. In much of northwestern Morocco, species of *Cistus* are the first shrubby pioneers.[c] They soon collect in extensive clumps, but die out after ten to fifteen years if not burned again. Large areas in Jbala and Ghmara, now covered with *Cistus monspeliensis*, *C. albidus*, and *C. ladaniferus*, probably were once covered with forests of cork oak or holly oak. Fires usually do not destroy the aerial organs of trees protected by thick bark, but the mortality rate rises sharply immediately after the bark has been stripped.[d]

When aerial organs are destroyed, both cork oak and holly oak reproduce from shoots. An occasional fire may even serve to regenerate a senile forest. But extreme care must be taken to prevent further destruction, for *Cistus*, *Erica*, and other heliophilous shrubs spread over the surface as soon as more light reaches the ground. Since the expanding secondary growth is highly inflammable, this process increases the danger of recurrent fires.[e] After several fires, the mesophytic plants are replaced by species more xerophytic as well as more heliophilous, indicating a change to drier soil conditions.[f]

[a] Kuhnholtz-Lordat, *La Terre incendiée, passim*, cited in note 32.

[b] *Ibid.*, pp. 43 ff.

[c] Because of its rapid growth and abundant crop of seeds, *Cistus* has been used in California (113) to protect denuded slopes. Gustaf Juhren, "The Use of *Cistus* in Erosion Control," *Lasca Leaves*, Spring, 1956, pp. 26–29.

[d] See also Boudy, *op. cit.*, I, 663 ff., cited in note 5; and A. Dugelay, "La remise en valeur des forêts de chênes-lièges incendiées," *Rev. Forestière Française*, November, 1951, pp. 687–694.

[e] Boudy, *op. cit.*, I, 649, describes *Erica arborea* as an "élément ignicole par excellence."

[f] On the effects of fire in similar environments, see A. W. Sampson, *Plant Succession on Burned* (113) *Chaparral Lands in Northern California* (Berkeley: California Agricultural Experiment Station, 1944); R. S. Adamson, *The Vegetation of South Africa* (London: British Empire Vegetation Committee, 1938); W. B. Turrill, *The Plant Life of the Balkan Peninsula* (Oxford:

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The main difference between the effects of fire in broad-leaf forests and in coniferous forests is that the latter, with the exception of the Barbary thuya, do not reproduce by coppice shoots. The resinous bark of maritime and Aleppo pines is highly inflammable, and since neither tree reproduces from shoots, burning is usually fatal. Yet both species, especially the Aleppo pine, are pyrophytes. Indeed, the presence of a large number of pine seedlings is a sure indication of recent burning. Both species produce abundant seed, and proliferation is encouraged by the destruction of competitive growth. If fifteen or more years have elapsed since a fire, the seedlings reach maturity and the ground is again littered with seeds; but recovery is thwarted by more frequent fires.

Little is known of the effects of fire on the Moroccan fir, but it is probably unimportant as an agent of deforestation. The three main stands of fir grow on the highest slopes of limestone mountains, where there is little underbrush. Furthermore, these mountains do not have sufficient surface water to support permanent human settlement. Goats driven to the mountains from the lower slopes have destroyed many seedlings, but there is little evidence of destructive forest fires. Nor is there evidence of destructive fires in relatively undisturbed stands of cedar. Such forests have little underbrush to serve as kindling, and the cedar itself does not burn easily. But fires may be serious where cedar forests have been invaded by secondary growth. Most of the shrubs common in open stands of cedar—*Cistus, Daphne, Genista, Cystius, Thymus,* and *Halimium*—are highly inflammable. Occasional fires followed by long periods free of disturbance generally do not cause deforestation, but deforestation results when seedlings are destroyed before they can produce seed. The critical interval is disadvantageously long, for the Atlas cedar does not produce abundant seed until it is forty to fifty years old.

Destruction by Domestic Animals

It would be hard to overemphasize the destruction wrought by grazing and browsing. More than half a million sheep and over a million goats are maintained in this zone. These figures are impressive, but the striking fact is that so large a number of animals are maintained by sedentary farmers. No tribe in northern Morocco is nomadic, and only the Ulad Stut and Aith Bu Yihyi practice transhumance. The main types of pastoral disturbance are well described by Braun-Blanquet.[*] Heavy pasturing causes: (1) withdrawal of large quantities of plant matter, (2) mechanical damage to plants by grazing, browsing, and trampling, (3) selective destruction of desired plants, (4) introduction of nitrophilous communities, and (5) alteration of micorelief.

The few cattle and camels kept in northern Morocco probably are not important agents of deforestation. Both animals are used almost exclusively for draft purposes, and few villages can afford to maintain more than one team. Authorities disagree on whether sheep have been significant factors in the process of deforestation. Most of the sheep in northern Morocco are in the drier and warmer parts of the zone, i.e., Garet and the eastern Rif. Woody plants are too

Clarendon Press, 1929); and B. O. Coventry, "Denudation of the Punjab Hills," *Indian Forest Records*, 14 (1929), 49–78.

[*] Braun-Blanquet, *op cit.*, pp. 367–368, cited in note 31.

7: Mikesell K-4,5 (1955-1957) 1961 MX3 Rif MX3

233 311 tough and massive to be adversely affected by grazing, but sheep can destroy shoots and seedlings, particularly those of the resinous trees.[a] The presence of monotonous formations of *Stipa tenacissima* in the lower Moulouya Valley and on the Algerian Hauts-Plateaux probably indicates overgrazing, for a history of excessive grazing may be inferred wherever hard tussock grasses have replaced more palatable growth.

Where goats are numerous, deforestation is accelerated, for no hillside is too steep to daunt this very agile creature, and few plants escape its voracious appetite (pl. 8, *a*). In Arcila, goats scale the nearly vertical Portuguese walls, and in the Sous Valley they climb into *Argania* trees. Not content with the grazing of grass, goats tear it up by the roots. When woody browse is exhausted, the soil itself is grazed in an attempt to get at the seeds of grasses and other plants. It is not surprising that the goat should be described as an "ecologic dominant,"[b] and that many naturalists would like to see it become extinct, except in zoos.[c]

[372] The most serious deforestation occurs when heavy browsing follows burning. Premature browsing or grazing results in the destruction of seedlings before they can produce a new crop of seeds. The French forestry service has ruled that burned areas should be closed to pasture for at least six years. The recovery of cedar forests may be thwarted if excessive browsing takes place within twenty years.[d]

311 137 The best-known relict of the cedars of Lebanon, a stand of several hundred trees, is protected from vandalism by a church and from goats by a stone wall.[e] In open places in the Mamora forest, young cork oaks survive only within a protective cluster of palmetto. On the semiarid plains of northeastern Morocco, *Pistacia atlantica* rarely survives unless it is protected by a spiny hedge of zizyphus or sumac (*Rhus pentaphylla*), and in the Sous Valley the latter species plays an even more vital role as a protector of young *Argania* trees. In the mountains of northern Morocco, seedlings of cedar, pine, and fir are protected by the armature of the juniper. Elsewhere on the Mediterranean versant, young trees may be protected by *Genista, Calycotome, Ulex,* and other thorny Leguminosae.

311 233 392 137 Trees that reproduce by coppice shoots are seldom completely destroyed, but excessive browsing may reduce them to shrub form. In the geographic textbooks the scrub or dwarf state of the Mediterranean woodland is often described as a consequence of the Mediterranean precipitation regime. The error of this generalization is manifest in the holly oak. That the stunted and deformed appearance of this tree results from fire-induced sprouting and browsing is evident when stately trees growing on protected sites are compared with the prevalent forms. Neither climate nor any other element of the inanimate environment can explain

[TEXT CONTINUED ON PAGE 107]

[a] Boudy, *op. cit.*, I, 616, is more emphatic: "Il est d'observation courante au Maroc, comme en Algérie, que dans tous les massifs de résineux où le parcours des moutons est intense, il n'y a pas de régénération et que ces massifs sont condamnés à disparaître à plus ou moins longue échéance."

[b] Marston Bates, "Man as an Agent in the Spread of Organisms," in Thomas, *op. cit.*, p. 798, cited in note 7. [113]

[c] Raymond Furon, "The Gentle Little Goat: Arch Despoiler of the Earth," *The Unesco Courier*, January, 1958, pp. 30–32. [113]

[d] Cf. Boudy's comment, *op. cit.*, II, 532: "Régénération de la cédraie et pâturage sont choses incompatibles." The prerequisites of recovery probably include at least three or four years of unusually heavy precipitation.

[e] W. C. Lowdermilk, "Lessons from the Old World to the Americas in Land Use," *Smithsonian Inst. Ann. Rept. 1943* (Washington, D.C., 1944), p. 416. [113]

A, [See p. 132--Analyst]

7: Mikesell K-4,5 (1955-1957) 1961 MX3 Rif MX3
Jebala MX2
Senhaja MX4

the stunted form of this tree. The same remarks apply to dwarf forms of thuya and oleaster. On protected sites even the palmetto may become a tree and, when disturbance is manifest, dwarf forms of cedar develop.

Vegetation on Sacred Sites

Throughout Morocco and to some extent elsewhere in the Muslim world, cemeteries are regarded as sacred ground. Sanctity is ascribed also to the areas adjacent to tombs or shrines of saints (*murabitin*). The cult of saints has been an important factor in Moroccan history, and tombs or shrines are found in the territory of each tribe.[a]

Sacred sites often constitute islands of verdure. This correlation is not unique. In *The Golden Bough* Sir James Frazer describes sacred woods in many parts of the world.[b] The interesting feature of the Moroccan situation is that such groves are extraordinarily numerous and that the veneration relates to the ground in which plants grow and not to the plants themselves.[c] Protected growth is usually more dense than the growth on adjacent profane land, and the height and girth of individual plants exceed those of plants growing on unprotected land. Some species (*e.g.*, *Pistacia lentiscus* and *Chamaerops humilis*) rarely achieve arborescent forms on unprotected sites.

The nature of the protected growth varies from a single shrub or tree to thickets and groves. Figure 25 shows the silhouettes of vegetation on a few sacred sites. These examples, selected from hundreds, illustrate the general pattern (cf. pl. 9, *a* and *b*).

Figure 25, *a*, shows a few mature cedars surrounded by a dense growth of holly oak. The prevalent vegetation in this area is a shrub formation dominated by *Cistus laurifolius*. There are no other cedars within a radius of several hundred meters, and holly oaks, apart from those on sacred sites, are in scrub form. It is evident that succession has resulted in a retrogression from cedar to oak forest and then to a sparse cover of shrubs.

Figure 25, *b*, illustrates a protected formation dominated by oleasters (cf. pl. 9, *a*). *Pistacia lentiscus* becomes prominent where oleasters are widely spaced and light reaches the ground freely. Palmetto and thuya, even more heliophilous, are confined to the edges of the protected growth. In the surrounding area the vegetation is limited to shrubs. Numerous other examples of oleaster groves fringed with pistacia and palmetto could be described. A handsome grove appears at the tomb of Sidi Manari on Cape Malabata opposite Tangier. Five groves appear on one ridge between Tangier and Tetuán. Others appear on the marine terraces between Tangier and Arcila, and on the lower slopes of the limestone mountains

[TEXT CONTINUED ON PAGE 110]

[a] E. Lévi-Provençal, "Marabout," in H. A. R. Gibb and J. H. Kramers, eds., *Shorter Encyclopaedia of Islam* (Leiden: E. J. Brill, 1953), pp. 325–326; Emile Dermenghem, *Le Culte des saints dans l'Islam maghrébin* (Paris: Gallimard, 1954); Edward Westermarck, *Ritual and Belief in Morocco* (London: Macmillan and Co., Ltd., 1926).

[b] Sir James Frazer, *The Magic Art and the Evolution of Kings* (New York: The Macmillan Co., 1935). Part I of *The Golden Bough*.

[c] J. Cola Alberich, *Cultos primitivos de Marruecos* (Madrid: Instituto de Estudios Africanos, 1954), refers to tree worship (*dendrolatría*), but the evidence he cites relates to popular ideas of the medicinal and magical qualities of plant material (leaves, seeds, acorns, etc.) and not to the sanctity of plants as such. It is possible, for example, to recognize magical qualities in pine cones and yet have no reluctance to destroy or mutilate pine trees. In Morocco the important consideration is not what qualities a plant may possess but *where* it grows.

A, [See p. 133--Analyst]